NDIA – Expeditionary Warfare Conference

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Take Aways

- Technology base of Naval Architecture
- The key to Seabasing is Systems of Systems Engineering and the “Force Architecture”

Hull Form Versus Performance Features

	Speed Payload	Range	Seakeeping	
Displacement Monohulls	25-40knots	SOA	High	Trans-Ocean
Displacement Multihulls	~55 knots	Excellent at Speed ARCS – Good at rest	Good	Trans-Ocean
SWATH & Variants	14-30 knots	Excellent all Around	Low	Trans-Ocean
Planing Hulls	60 knots+	High Accelerations	Moderate	Trans-Ocean
SES	60-65 knots	Good with Ride control	Low	Short Range
Hovercraft	45-55 knots	Moderate with Ride control	Low	Short Range
Hydrofoils	30-70 knots	Excellent High, Poor Low Speed	Low	Short Range
Lifting Body & Hybrids	30-45 knots	Excellent at High and Low Speed	Good	Trans-Ocean

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Requirements Analysis

- Iron Triangle (Speed, Endurance, Payload)
- Reality ($$)
- Performance Requirements (Beachable, Surface Connector Interfaces, Aviation, etc.)
- Art of the Possible
  - Sensitivity Analysis
  - Find the knee in the curves
- Process is “Validated Requirements”

SEABASING – A Systems of Systems Engineering Problem

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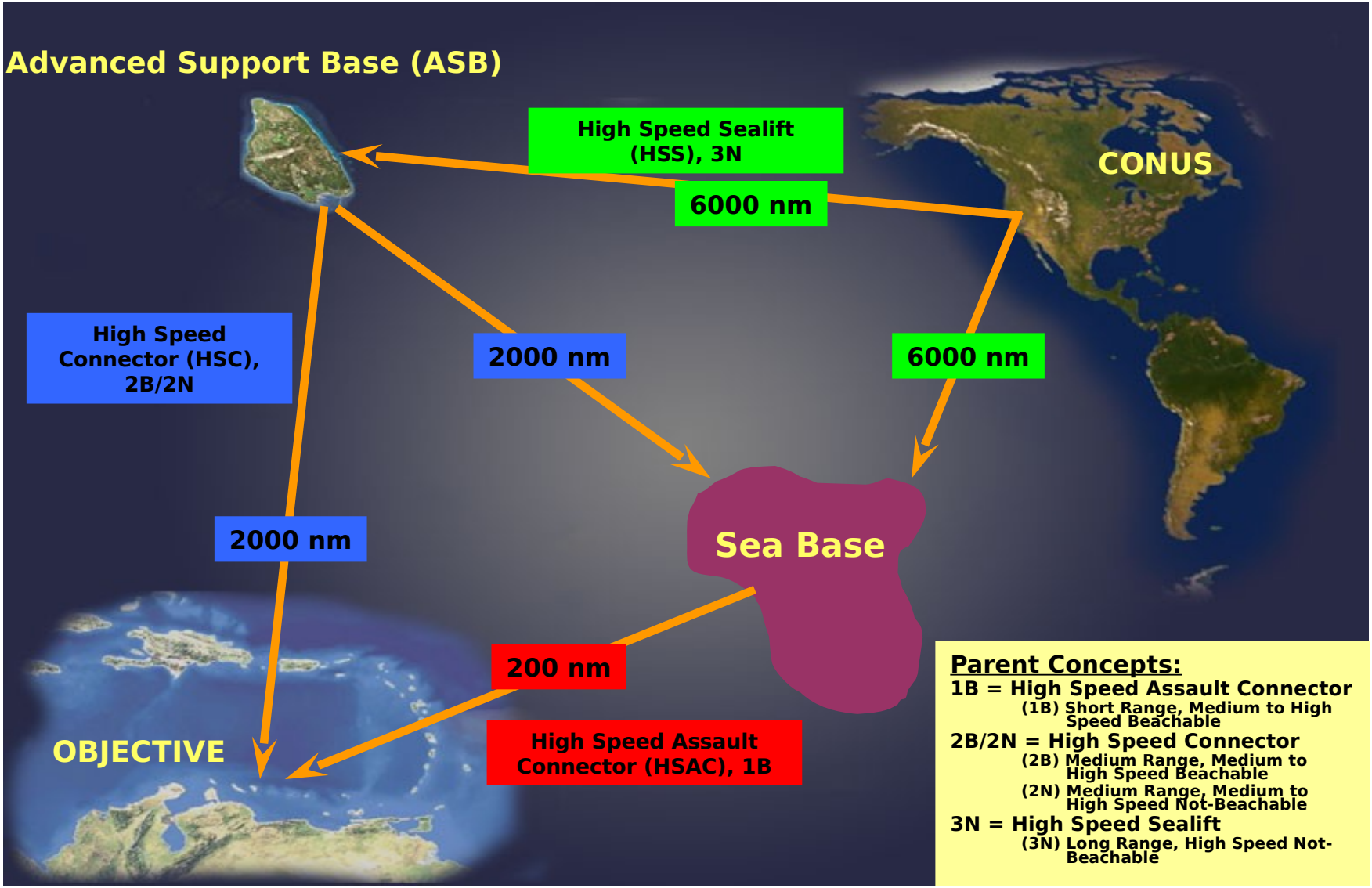
Ship Technologies

- Critical technologies
  - Advanced high-speed hullforms
  - Drag reduction
  - Hull/propulsor integration
  - High power density propulsion machinery
  - Fuel efficient power generation machinery
  - Hydrodynamic structural loads
  - Transfer of cargo at sea (Sea State 4)
  - Lightweight structures
  - Non-ferrous ship structures
  - Signatures
  - Beach interface

DEFINE THE PROBLEM
Sea Connector Concept


Advanced Support Base (ASB)
High Speed Sealift (HSS), 3N
6000 nm
CONUS
High Speed Connector (HSC), 2B/2N
2000 nm
6000 nm
2000 nm
Sea Base
200 nm
High Speed Assault Connector (HSAC), 1B
OBJECTIVE
Parent Concepts:
1B = High Speed Assault Connector
(1B) Short Range, Medium to High Speed Beachable
2B/2N = High Speed Connector
(2B) Medium Range, Medium to High Speed Beachable
(2N) Medium Range, Medium to High Speed Not-Beachable
3N = High Speed Sealift
(3N) Long Range, High Speed Not-Beachable

NAVAL SHIP DESIGN

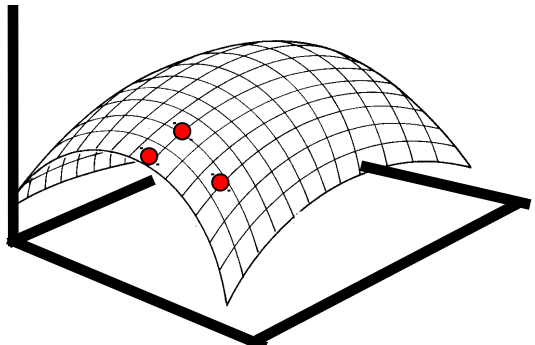
Conventional vs New Approach

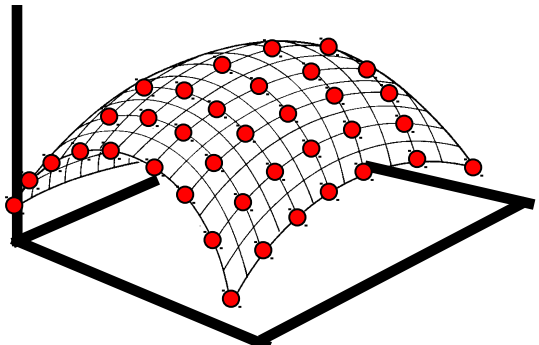
Conventional Approach: Point Based Exploration of Design Space

- Designs are manually generated
- Time-consuming
- Few data points
- Limited knowledge gained from the few design points
- Optimization is difficult due to competing performance and economic requirements.

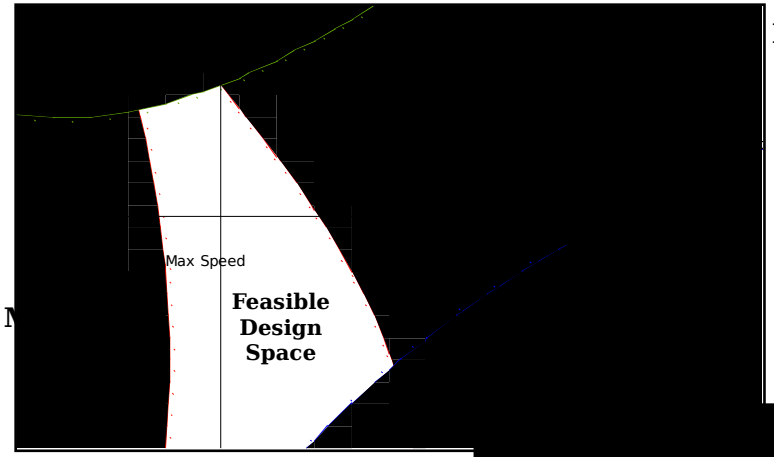
New Approach: Systematic Exploration of Design Space

- An automated design process.
- Systematic exploration of design space
- Easily optimized to meet multiple, competing objectives.

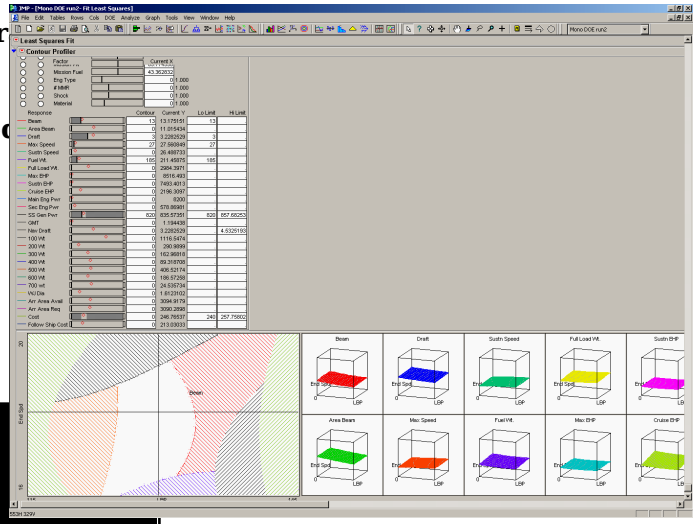




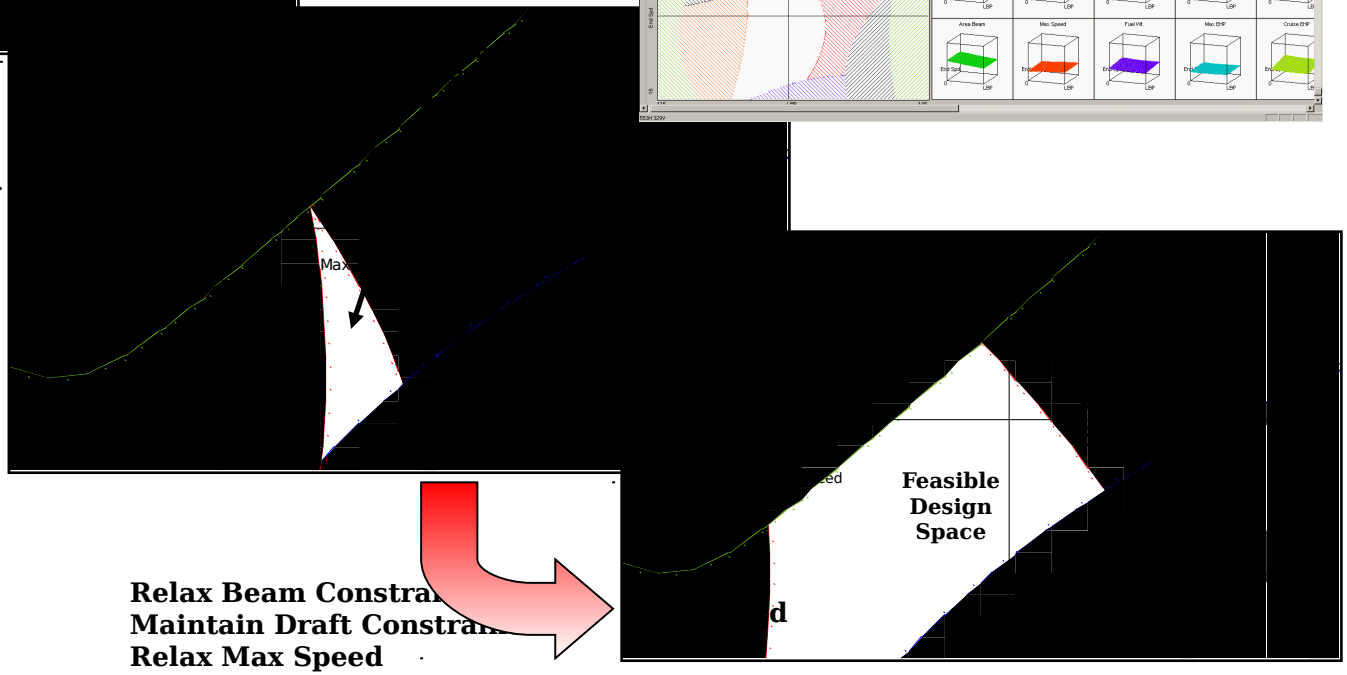
DESIGN SPACE EXPLORATION
Dynamic Contour Profiler Example



Placing Design Constr
- **Beam**
- **Draft**
- **Max Sustained Speed**
- **Cost**

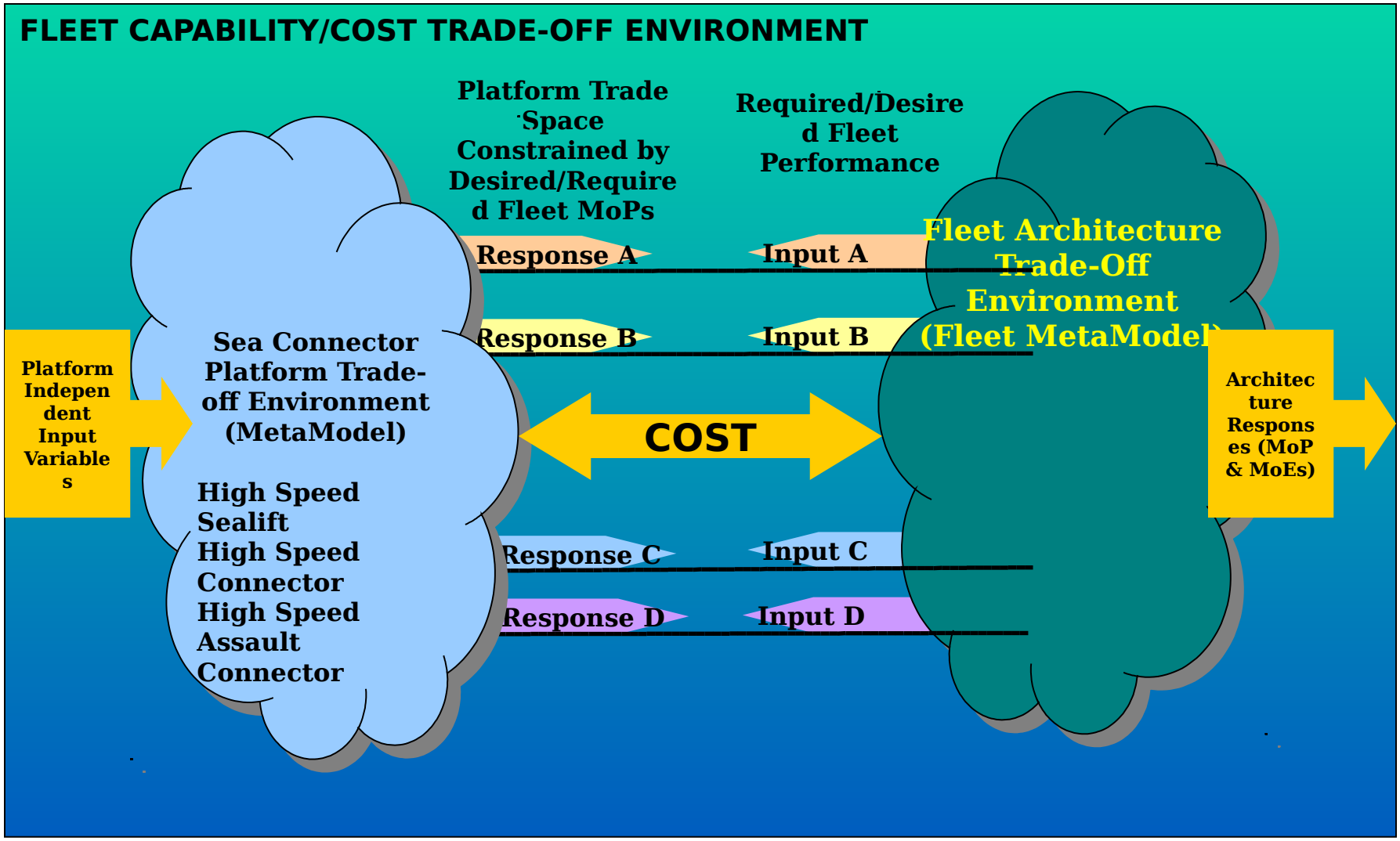


Increase Beam Constrain
Decrase Draft Constraint
Increase Max Speed Constraint
Decrease Cost Constraint

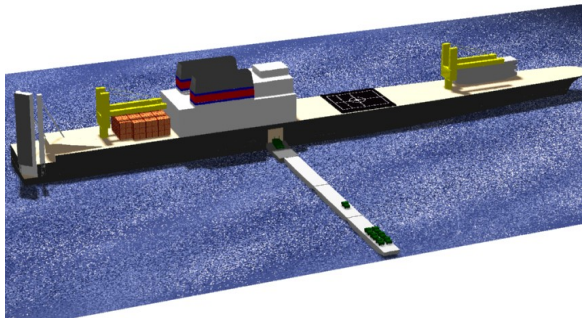


Relax Beam Constra
Maintain Draft Constrai
Relax Max Speed Constraint
Maintain Cost Constraint

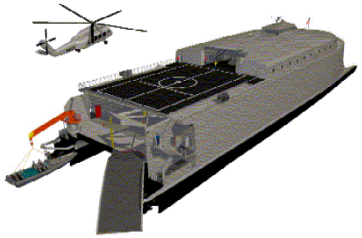
Mapping Platform Characteristics to Fleet Requirements



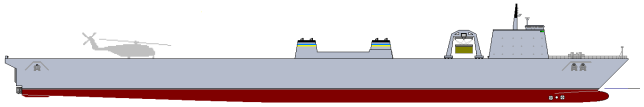
Sea Connectors - Conce



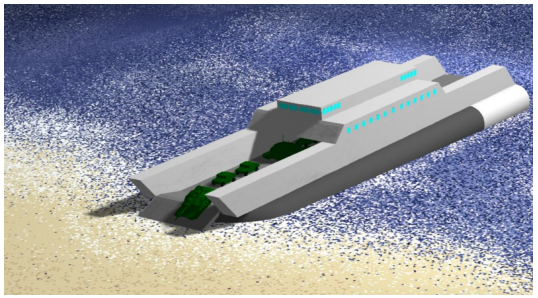
High Speed Response Ship (HSRS) (Concept)



High Speed Vessel (HSV 2)



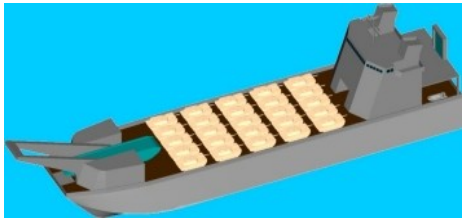
Sea Base Connector – L (SBC-L) (Concept)



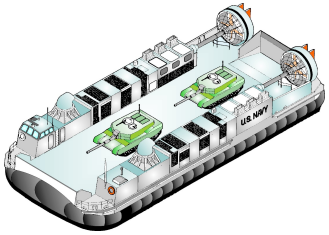
anding Craft, Tank, Air Cushion (LCTAC) (Concept)

High Speed Afloat Forward Staging Base (HSAFSB) (Concept)

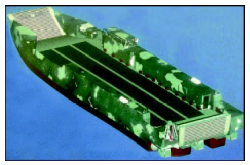
Logistics Support Vessel (LSV)



Combat Logistics Vessel (CLV) (Concept)



Landing Craft, Air Cushion Heavy (HLCAC) (Concept)



Landing Craft, Utility (Replacement) LCU-R (Concept)

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QUESTIONS?